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Modified cosmological scenarios through extended horizon entropies

We apply the gravity-thermodynamics conjecture, namely the first law of thermodynamics on the Universe horizon, but using the generalized Kaniadakis entropy instead of the standard Bekenstein-Hawking one. The former is a one-parameter generalization of the classical Boltzmann-Gibbs-Shannon entropy, arising from a coherent and self-consistent relativistic statistical theory. We obtain new modified cosmological scenarios, namely modified Friedmann equations, which contain new extra terms that constitute an effective dark energy sector depending on the single model Kaniadakis parameter K. We investigate the cosmological evolution, by extracting analytical expressions for the dark energy density and equation-of-state parameters and we show that the Universe exhibits the usual thermal history, with a transition redshift from deceleration to acceleration at around 0.6. Furthermore, depending on the value of K, the dark energy equation-of-state parameter deviates from ΛCDM cosmology at small redshifts, while lying always in the phantom regime, and at asymptotically large times the Universe always results in a dark-energy dominated, de Sitter phase. Finally, even in the case where we do not consider an explicit cosmological constant the resulting cosmology is very interesting and in agreement with the observed behavior.

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